DOCUMENT RESUME

ED 317 158 IR 014 092

AUTHOR Jassem, Harvey C.
TITLE Technology Compatibility Standard Setting & Its Applicability to Emerging American Media.
PUB DATE May 89
NOTE 31p.; Paper presented at the Annual Conference of the International Communication Association (San Francisco, CA, May 26, 1989).
PUB TYPE Information Analyses (070) -- Speeches/Conference Papers (150)

EDRS PRICE MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS Broadcast Industry; *Communications Satellites; *Equipment Standards; *Federal Regulation; *Radio; *Telecommunications; *Television; Videotex
IDENTIFIERS Advanced Television Systems; Federal Communications Commission

ABSTRACT

This paper examines the role that standard-setting plays in the adoption and growth of new technologies, particularly in the development of electronic media. Background on technological standardization is provided in the first section, including discussions of the costs and benefits of standardization and the timing of standards setting. The second section presents discussions of standard setting for various telecommunication media: (1) monochromatic television; (2) color television; (3) stereo television; (4) AM stereo; (5) teletext; and (6) direct broadcast satellites. Lessons from Federal Communications Commission (FCC) behavior in telecommunication standardization are described. The third section describes advanced television systems as a new agenda of the FCC and considers prospects for a U.S. advanced television standard. (44 references) (GL)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED317158

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

X This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

TECHNOLOGY COMPATIBILITY STANDARD SETTING & ITS APPLICABILITY TO EMERGING AMERICAN MEDIA

HARVEY C. JASSEM

DEPARTMENT OF COMMUNICATION
UNIVERSITY OF HARTFORD
WEST HARTFORD, CT 06117

(203) 243-4633

Presented to the Mass Communication Division, International Communication Association conference, San Francisco, May, 1989.

IR014092

BEST COPY AVAILABLE

"PERMISSION TO REPRODUCE THIS MATERIAL IN MICROFICHE ONLY HAS BEEN GRANTED BY

Harvey C. Jassem

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

TECHNOLOGY COMPATIBILITY STANDARD SETTING & ITS APPLICABILITY TO EMERGING AMERICAN MEDIA

For years there has been speculation that some day, perhaps some day soon, television pictur quality will be improved markedly. We will get larger screens with fabulous picture resolution, the rumors suggest. Certainly we have seen larger television screens. Projection television is becoming more popular, though its availability dates back to the early days of television. What comes with the large screen televisions, however, is miserable resolution.

Must it be that way? Yes and no for the present. Solutions are being presented, and ironically, that is part of the problem. The nature of the broadcasting medium, of which television is a part, and the emergence of several different "solutions" to the large screen-high resolution problem make for an interesting tangle of interests and forces which must be sorted out in board rooms, laboratories, appliance stores, and governments, both within the United States and in the rest of the world. These are some of the players who will determine what television of the future will look like and cost.

The most successful implementation of a new kind of television will be dependent on its wide acceptance and adoption. That is not as unnecessarily redundant as it sounds. Unlike the print media where variety in the height, width, thickness, color, etc. pose no serious obstacle to the production, distribution, or consumption of the print products, and in fact, where variety in format may sometimes be used to enhance sales, variety of that sort for television broadcasting in any one part of the world is nearly impossible, at least from an economic point of view. Because the broadcast information is essentially reconstructed at the television receiver (set), that receiver must understand the code in which the arriving television signal is/was composed and sent. It's not that Japanese-made television sets will not work in English-speaking countries unless the sets understand English, rather they must understand the configuration of television signals employed there. Most of the broadcast signal technical conventions have been standardized in one way or another. In the United States, this is often done by the FCC.

This paper examines the role that standard-setting plays in the adoption and growth of new technologies, particularly in the development of electronic media. With full recognition that the American standard-setting process for high resolution television is far from complete, the relevance of the standardization issue to Advanced Television is clear.[1]

STANDARDIZATION

Technological standards, no matter how they are arrived at or imposed, generally fall primarily into one of two categories. They may establish safety limitations as in the case of pollution emission minimum standards. Or they may have more do do with achieving uniformity and interchangeability. (Grabowski and Vernon, 1979) Invoking the names of economists Adam Smith and Paul Samuelson, Charles Kindleberger squarely places standards under the rubric of "public goods." (Kindleberger, 1983, p. 377) Though his discussion deals primarily with standards of measurement, his assertion that standards lend themselves to special economies of scale is relevant. "The more producers and consumers use a given standard, the more each gains from use by others through gains in comparability and interchangeability." (p. 377) Around the world, people know what is meant by the arbitrary — but standardized — weight measure of a "gram." It is this latter type of standardization, the one concerned with achieving some degree of uniformity, that this paper concerns itself.

David Hemenway, in his book Industrywide Voluntary Product Standards, discusses disasters and serious inconveniences that have been directly attributable to a lack of technological standards. These include fire brigades standing around helplessly at huge fires because thei hose couplings did not match those of the fire hydrants, and rail transit made unnecessarily cumbersome and expensive as a result of different track sizes in different parts of a country. Of a less technological nature are the different standards of time. Cities and regions and companies each used to have their own "official" clocks, which may or may not have corresponded to the "official" clocks of others. The adoption of standards made it possible for different fire brigades to help one another, railroad trains could traverse larger areas without needing to unload one train onto another due to track size changes, and those trains (and their customers) could know that 9 a.m. meant 9 a.m.

Standards are not of the same importance in all contexts. Items that do not have to interface with others need not be standardized. It matters little whether two books are the same size or use the same color ink or print fonts. Yet even non-interacting items may be more useful if their components are standardized. Imagine the difficulty in replacing a light bulb if every lamp manufacturer designed his/her own unique light bulb socket. Or worse, what if every lamp manufacturer designed a unique electrical plug for their products? In such a case the consumers wouldn't have to wait for the bulb to burn out in order to find themselves with lighting problems.

While some standardization issues are matters of convenience or slight cost and price economy, others bear heavily on issues of life or death and whether a particular type of product will be produced and used. Whether blank video tapes are sold in durations of 30 minute increments is not nearly as significant as whether different brands of those tapes ca be successfully used in different brands of video tape players and recorders.

Braunstein and White (1985) identified four circumstances that typify the need to standardize:

> 1. The user of a system, network, or device would like to be able to use or consume or sample from (or have the potential to do so) possible services of the system, present and future (i.e., receive all of the channels, reach all the points on the network, play all the disks, etc.). . . .
>
> 2. There is no relatively low-cost "add-on" device or other translating or converting technology that would allow a user jointly to use the otherwise incompatible technologies. . . . .
>
> 3. The basic equipment is relatively expensive and long-lived, so that multiple sets of equipment to handle the differing technologies are expensive. If television sets cost $2.50 each, we would probably not care whether all channels could be received by a single set; if the durability of television sets were such that they lasted only a month, we probably would not care about the incompatibility of current sets with future technologies. . . . .
>
> 4. In the case of disks or tapes or computer programs, replication of the complete repertory for each technology is relatively costly. (pp. 339-340)

These are, of course, indicators rather than triggers. The salience of any of these points for a given technology will vary with the users' resources and needs. The mere presence of any (or even all) of these conditions neither necessitates nor guarantees standardization, it simply suggests that standardization might be an effective means for mitigating these problems.

When any standard is imposed, there are bound to be winners and losers. Thus on the way to setting a standard, there is typically jostling that goes on in the political and economic arenas to try and ensure that any standards that are established heighten, or at least do not diminish, the market power of the various participants. When there is agreement about the standard, that jostling will be a non-issue. But, as Besen and Saloner (1988) find,

> Where preferences differ, each party will promote as the standard the technology tha

> maximizes its private benefits, not the one that maximizes total social benefits. In these cases, standard-setting can no longer be viewed solely as a search for the technically best standard, or even as a process for establishing one of a number of "equivalent" technologies as the standard. Instead, standard-setting is a form of competition in which firms seek to gain advantages over their rivals. (p. 5)

To the extent that government is involved in the standard setting process, that process will necessarily be political. In his classic, Regulating Business by Independent Commission, Marver Bernstein (1955) asserts that regulation is political

> not in the individious image of progressive reformers, that is, corrupt, fraudulent, dishonest, and motivated by desire for private gain. Politics refers rather to the emergence of public issues, formulation of public policies, and administration of governmental affairs. . . .
>
> .....
>
> The political nature of regulation reflects the inadequacy of the tools of economic and political analysis in providing a sure line of direction for the formulation of regulatory objectives. The determination of regulatory goals does not result inevitably from the logical analysis of certain economic facts, nor is it automatically deduced from a set of propositions concerning the nature of the political state and the proper boundaries of political action in a democratic society. Economic analysis, for example, may help to formulate regulatory methods and policies in the light of certain goals and policies, but it cannot be expected to provide a guiding set of principles for the discovery of the public interest and the refinement of appropriate goals. (pp. 258-9)

While at their best, economic and technological assessments may provide a glimmer of insight into possible outcomes of industrial development as influenced by various regulatory approaches, the political nature of the regulatory process suggests that the standard-settin decision may have as much or more to do with the garnering and application of support for one option over another than it has with the economic/technological analysis. The quality of the adopted standard, then, is likely to be an artifact of the interested parties who are actively championing particular standards.

The regulators need not be merely a wind sock, pointing in the direction of the prevailing breezes. On their own, or more likely with the support of at least some of their constituents, the regulators can reframe issues and provide incentives to drive technological

change. (Ashford, et al, 1985) Once public policy goals are articulated, regulators have the power to promote innovation and conserted industry action to hasten the achievement of those goals. Even in cases where the public policy agenda is not a clear motivating force, regulators may spur innovation by either removing barriers to that innovation or by setting/allowing industry to set technical standards. One expressed reservation relating to this sort of regulatory behavior relates to concern about the regulators' ability to correctly assess the likely impacts of new technologies. (Green, 1983, Schmandt, 1984)

Uniform standards may be achieved in a number of different ways. The free and competitive "marketplace" may see a standard emerge on its own, either because a particular way of doing something was widely seen as "best" or "most efficient," best marketed, marketed by a dominant firm, etc. An industry may establish standards through cooperative behavior, as in the case of a trade association providing the means and incentives for standard setting. (Davis and Helfand, 1985, p.11) These non-government imposed standards are generally known as "de facto" standards. At other times the standards may be established through governmental action of varying degrees (Besen & Johnson, 1986, pp.1-2). Standards "frequently result from taking de facto standards and documenting them." (Johnson, Sirbu, Mitchell, 1985, p. 79) It is even possible for governmental action to take the form of working against the adoption of standards. Note that there may be defacto standards established when the consumer is a huge monolith and sets its own specifications when it requests bids from suppliers. The U.S. military may well have "set the standard" for the manufacture of wool watch caps or ammunition due to the large size of their orders. This sort of default standardization is not what is under discussion here. Instead, the focus here is on standards that are consciously established in concert with government approval.

"Costs" of Standardization

Regardless of how "necessary" standard setting might be in a given context, the mere establishment of standards will likely affect firms' market power, consumers' choice, innovation, etc. Standard setting, even when politically, legally, economically, and socially acceptable, and even when it may effectively solve the sorts of problems Braunstein and White discuss, may bring on entirely new sets of problems or concerns. Among the "costs" or "casualties" of standards setting are

- Firms not already complying with the new standard will be at a competitive disadvantage in having to re-tool
- Premature obsolescence of things not meeting the new standard

•There will be less variety. Consumers will have a narrower range from which to choose, and some will be unable to purchase their preferred product

•Innovation and research and development may be stifled as newer and better technology may be hindered and limited by the requirement that it be developed only in such ways as would be compatible with existing standards (labeled as "excess inertia" by Farrell and Saloner, 1986, pp.169-173).

•Standards may work against the normal marketplace forces where the result (indeed, perhaps the goal) of a standard setting may be to hurt the ability of new entrants into the market, or hurt firms who are complying with an existing standard when a new "standard" is announced as a result of the actions taken by a dominant player.

•There's a risk that a "wrong" or "bad" standard may be chosen

•As technology and innovation grow, standards risk lagging behind the state of the art (Farrell and Saloner, 1986, p.169)

•With change, the status quo will be changed, causing some disorientation as the players and their powers change. Threatened dominant interests may balk and attempt to impede what might be in the public good.

•Compatibility with standards may be misunderstood to mean something along the lines of "equal in quality". Standards are not likely to specify every possible technological variable, particularly if they are designed with multiple manufacturers in mind. Meeting with certain minimal standards is not the same as exceeding those standards. (Johnson, Sirbu, and Mitchell, 1985, p. 80)

"Benefits" of Standardization

However, assuming the regulators or the industry itself move forward and promulgate standards, the benefits such standards may bring with them include:

•Public and/or worker health and safety may be better protected

•Lowering the investment risk may bring with it the introduction and dissemination of a new and awaited technology

•Production costs and consumer prices may lower as a result of reduced inventory requirements, heightened competition, easier consumer comparison

•There may be a stronger second-hand market, benefitting both those wanting to sell and those wanting to purchase used equipment (Farrell and Saloner, 1984, p.1)

•Lowering the risk that the consumer will select the "wrong" product or one that will be quickly obsolete (Besen & Johnson, 1986, p.8)

•Technological improvements will be focused within the parameters of the

standards

•Increased availability of products/services that are designed to interact or interface with the standard, thereby enhancing the value of the standardized item

•Consumers will more likely learn necessary new skills associated with the new standardized item

•Greater likelihood that the standardized item will be widely adopted; more wide-spread service. Reduces a firm's risk and reluctance to switch to a new technique if there is assurance that others will do so as well.

•New firms can enter the production market without fear of consumer rejection of a new and incompatible product ("buy our new Velcro-stick light bulbs...")

•Promote competition among suppliers, thus lending a measure of market control on prices (Johnson, Sirbu, Mitchell, 1985, p.78)

•"The absence of 'duplicative' equipment" (Braunstein and White, 1985, p. 343)

•"Eliminate the translation costs of interconnecting incompatible systems" (Johnson, Sirbu, Mitchell, 1985, p. 78)

•Standardization, by increasing the opportunities for effective competition, may reduce the need for some direct regulation (Farrell and Saloner, 1986, p. 167)

Timing of standards setting

Assuming standard setting is deemed to be a good way to proceed, the timing of such an action becomes important. An argument can be made that timing is so important as to be a significant element in the decision regarding the advisability of standard setting in the first place. On the face of it, it would appear that to maximize the benefits and minimize the costs of standards, they should be set as early as possible. Lengthy waits before standards are agreed to or set may result in

•entrenched and disparate interests gaining strength, making agreement on a new standard more difficult to come by

•predatory or promotional pricing by some who will be willing to lose money in the short term in order to enhance the chances that their "technology" will become widely adopted and then become the de facto standard (It should be noted that early adopters of a new technique or technology may have incurred larger R&D costs and may be taking larger risks by introducing a non-standard item into the market, and hence the temporary market dominance early entrants might have may be appropriate and a way to encourage innovation that ultimately benefits the consumer).

•larger obsolescence costs to producers and consumers as as products that do not conform to a subsequent standard proliferate

- slower diffusion of the product type than might otherwise be the case[2]
- less competition and innovation than in the standard-controlled universe
- possible greater understanding about how the product will be used

At the very least, with time should come heightened understanding of the issue under consideration. "Better" ways of achieving the desired ends may be arrived at, given more time. Schwartz argues that at least with regard to telecommunication regulation, too rapid change may be at the cost of higher quality telecommunication and service to the public. (Schwartz, 1988) Krasnow, et. al (1983) take the argument a step further, suggesting that too early "interim" standards or arrangements may well lead to "frustration and needless expense on the part of all concerned, regardless of the fact that the "interim" route may be paved with good intentions." (p.769) They cite the "Boren Principle of Error Implementation," which states:

> Errors implemented by inaction are less dangerous than errors implemented by action. Errors by inaction have less impact and more mushistic graduality than errors of action. Graduality provides time for adjustment and of accommodation, and permits institutional homeostasis to take place. (Boren, 1975, p.21)

Farrell and Saloner (1986) posit that "early standardization is more desirable than late, if the same standard be set. Early standardization removes the incentive to wait for the standard to settle down, and thus encourages early adoption of the technology. Standardization of interfaces can also open up markets for those who are unable or unwilling to compete with whole systems." (emphasis added, p. 165) But, of course, the same standard may well not be set early and late in the process. If standard-setting is at all a political as well as technical and economic endeavor, and it most surely is, the balance of political (and technical, scientific, and economic) power is likely to change over time. New alliances may form to compete more effectively for standards in their interests against the interests of others. In fact, standard-setting may be used as a technique not to better the public's lot, and not to ensure greater competition, but to strengthen the market position of particular firms (or nations). Owen and Braeutigam (1978) discuss the strategic uses of innovation by regulated firms as a means to better their competitive and regulated standing. "A well-timed announcement of an innovation or technological breakthrough can moot a difficult [regulatory] issue which threatens to go against the firm." (p.5)

To the extent that government and interested parties are involved in the standard setting, the

process will, by definition and necessity, be political. And because dominant firms are likely to have more political muscle than smaller and perhaps newer entrants, they are likely to play a dominant role in both the substance and timing of standard setting. "Standards generally are created when desired by major firms, and rarely if opposed by them (unless other large concerns force standardization)." (Hemenway, 1975, p.90) Of course, the timing and direction regulated standard setting is likely to take will be a function of the regulator's "philosophy", as well as any political pressure. Regulators who see the public (or perhaps their own) interest strongly linked to the maintenance of the status quo are not as likely to ratify standards that would seriously threaten that status quo, whereas others who perceive a need for change will be less likely to protect the status quo.

The 'normative' time setting issue comes down to whether standards should be set early thereby foregoing the greater understanding and technological breakthroughs that may come with time in order to minimize obsolescence costs, or later when the standard can have the benefit of increased knowledge but may face the obstacles associated with greater obsolescence costs. Associated with those issues is the question of might it ever be too late to set standards that are at odds with the performance of the marketplace.

Timing becomes less important of an issue when obsolescence costs are minimal or non existent. Of course, in such situations, standards themselves are less salient issues.

STANDARDIZATION AND THE TELECOMMUNICATION MEDIA

The usefulness and hence value of telecommunication media are directly related to their ability to interface with others. Whether point-to-point media such as the telephone, or broadcast media such as radio and television, whether linked by wire, fiber, or airborne electromagnetic signals, telecommunication equipment is in the business of interfacing with other such equipment. A television set that does not "understand" and hence cannot decode signals coming to it might serve well as a giant paper weight or planter, but serves not as a television set. This "shared language" requirement is a basic tenet of communication models. That has been the primary motivation for standardization in this field. At least until now, media receivers had to be technologically compatible with the media transmissions. Media have not been smart or adaptable enough to "translate" discordant information into information they can understand without the aid of costly interfaces.

Of particular interest here are the forms of telecommunications that fall under government, or, more specifically, FCC regulation. Several illuminating pieces have been written discussing the FCC's role in telecommunication standards setting (Barke, 1985; Besen and Johnson, 1986; Besen and Saloner, 1988; Braunstein and White, 1985; Sterling, 1982, and parts of others). They note the Commission's concern for localism, universal service, cost efficiency, spectrum efficiency (many mutually exclusive users want access to the same limited spectrum resource), etc. These concerns raise the stakes and make even more important the need for standardization. While in recent years there has been some debate revolving around the degree to which the usable portion of the electromagnetic spectrum is inherently limited or finite, it seems apparent that there are more people/firms who want to use it than are presently permitted to use it. The spectrum and other means of telecommunication use a sort of closed system. There may be room for a lot of information transfer, but it is not unlimited at reasonable costs. Often that means that allowing one sort of telecommunication use in an area precludes another potential use of that spectrum space in that area. Garage door openers, wireless telephones, CB radios, broadcast television and radio, police and taxicab radios cannot all operate at the same time on the same frequencies in the same location, even though on bad days it may seem as if they are trying to do just that. This characteristic of telecommunication exacerbates the problem of standards setting.

In the U.S., the FCC chooses among users in allocating spectrum space. The Commission must attempt to set technological standards that ensure that reception equipment matches transmitting equipment, that there is no undue electromagnetic interference that would be either unhealthy or would interfere with other uses/users of the spectrum, that maximize efficiency, and that somehow make value judgments regarding the allocation of spectrum to various types of users, knowing full well that its decisions will affect the development potential of current and yet-to-be thought of uses.

The needs or desires of one segment of spectrum users cannot be viewed in isolation from th needs of other users and potential users. This complicates standard setting. In other arenas, this is less of a concern because other users don't have to share the same resource in such a fundamental way. If fire fighting interests agree that their water hoses should all have a certain diameter, that decision does not impede on manufacturers of other sorts of hoses or anything else. When spectrum users decide that they want to standardize a system of broadcasting that will use particular bandwidth, if such a standard is adopted it affects not only users of that service but all others wanting to use spectrum space for anything else. In addition, when it comes to airborne spectrum issues, there is no such thing as national

borders. So that even if the U.S. believed a particular spectrum use is a good trade off, its neighbors, who would also be affected by U.S. spectrum use, might not. International conventions to deal with broadcast spectrum standards must therefore be accommodated. Those conventions are likely to reflect national interests revolving around spectrum use, possible content questions, and local equipment and equipment manufactures. Electromagnetic spectrum standards setting issues bring with them, then, non-technological baggage. When the discussion must go beyond which standard would be best suited for serving its purpose, and also involves trade offs with other industries and other services available to the public, the potential for uncomplicated standard-setting is considerably diminished.

As a precursor to an examination of possible FCC involvement in domestic High Definition Television standard setting, a brief summary of previous telecommunication standard setting cases will be presented. Cases to be included are those of "monochromatic television," "color television," "television stereo," "AM stereo," "teletext," and "direct broadcast satellite."

Monochromatic Television

Before it would permit regular television service in the United States, the FCC insisted that a national transmission standard be set. (Besen & Johnson, 1986, p. 87) An industry group, the National Television System Committee (NTSC), formed several study groups to try and arrive at a standard and resolve differing opinions within the industry (Barke, 1985, pp. 145-145). Within a year of its formation, the NTSC presented and the FCC accepted a standard consisting of 525 lines and 60 fields per second. The 525 line standard represented something of a middle ground. Its selection was made more tenable because subjective tests of picture sharpness were "sensibly unchanged" for different numbers of lines being tested. (Fink, 1976, p.1327) Besen and Johnson suggest that the standard was set so quickly because there was industry agreement based on many years previous research and the various technological configurations being considered by NTSC did not represent proprietary interest on the part of any of the participants. (pp. 88-89)

Color Television

The FCC faced the issue of how to colorize television shortly after black and white television got underway. It faced significantly different proposals, the two major ones coming from RCA and CBS. The CBS method was incompatible with existing monochrome television broadcasting, meaning that if it were adopted, existing monochrome television receivers

would not be able to receive programs broadcast in color, at least not without some sort of adapter. The longer the FCC waited to endorse a standard, the more serious the incompatibility issue would become. With no consensus from the industry, and unable to "forge a compromise" between CBS and RCA (Barke, 1985, p.146), the Commission selected the CBS system as the standard in 1950. That standard was in effect for only a few months when the government ordered the cessation of color television manufacturing during the Korean War. During the hiatus, CBS stopped broadcasting in color (why broadcast in color when existing monochrome TVs could not receive the signals and the manufacture of new color sets was prohibited?) and the NTSC attempted to arrive at a compatible color system. RCA, along with a number of other manufacturers, arrived at a new and improved method and, at the NTSC's urging, it was adopted by the FCC three years after the initial CBS-based standard had been approved. Besen and Johnson suggest this change in standard was made possible because (1) the CBS standard had been abandoned, and a large group of manufacturers got together and cooperatively designed the new system, (2) the industry representatives who worked on the new standard understood the technical issues more than had the FCC, and (3) the new system was satisfactorily demonstrated to the FCC, unlike earlier RCA prototypes whose demonstrations were less than satisfactory. (pp. 93-94)

Stereo Television

The FCC's first formal foray into stereo television standards, in 1967, went nowhere. It was dropped by the Commission after no interest in offering stereo television was expressed by the industry. Ten years later, the issue was revisited by the Commission by a Notice of Inquiry. The Electronic Industries Association (EIA) studied the issue under the auspices of its Broadcast Television Systems Committee (BTSC) and, five years after it began, issued its support for a particular stereo television standard, even in light of some opposition from within the industry. During that interim, the FCC suggested it rely on a marketplace solution, rather than an FCC-imposed or endorsed standard. Reliance on the marketplace, which had been the FCC's response to calls for an AM Stereo standard, (see below) was opposed by industry groups who feared that without a standard, television stereo would flounder and fail. In something of a compromise, the FCC decided not to set a standard for television stereo, but did agree to "protect" the BTSC proposed system by allocating spectrum space to broadcasters complying with that standard and by prohibiting other systems from using that same spectrum frequency. (Besen and Johnson, 1986, pp. 61-71, Barke, 1985, pp. 149-150) Besen and Johnson and Barke credit the fairly unified industry position as presented by the BTSC with providing the foundation for the rapid diffusion and success of stereo television. Particularly if perceived differences between contending systems are not great, the support

for one system may be all that system needs to succeed whether in the marketplace alone or in the regulatory arena.

A. M. Stereo

Although the FCC was asked to authorize AM stereo as early as 1959 and 1960, it chose not to at that time and permitted the issue to fall by the wayside until it re-emerged some twenty years later. By the late 1970s, A.M.'s role as the dominant radio band in the United States ha expired. F.M., with its higher fidelity, stereo, and different programming had equalled and surpassed A.M. as the most listened to form of radio. From its new found second-class status, AM responded enthusiastically to a 1977 Notice of Inquiry re. AM stereo. In its deliberations the Commission considered the merits of at least six different AM stereo systems (Meyer, 1984, p.267). Three of those systems were tested and evaluated by an interdisciplinary broadcast industry group called the national AM Stereophonic Radio Committee (NAMSRC), which was sponsored by the EIA, National Association of Broadcaster (NAB), National Radio Broadcasters Association, etc. NAMSRC's findings were submitted to the FCC, though NAMSRC did not endorse any one particular system. (Besen and Johnson, 1986, pp.33-4)

In 1980, the FCC decided that a single AM stereo system would be in the best interests of the public (and, presumably, AM broadcasting), despite its own Broadcast Bureau's recommendation that minimum standards be set rather than a single standard. The various proposals before the FCC were each compatible with AM monophonic broadcasting and each incompatible with the other stereo formats. An initial proposed FCC decision in favor of one of the systems led to a barrage of criticism from those favoring a marketplace approach and by those favoring systems not selected by the Commission. While the FCC considered the responses to its proposed decision, Ronald Reagan was elected President and shortly thereafter he appointed four new members of the seven-member FCC. The deregulatory agenda of new FCC Chair Mark Fowler included a 1982 decision not to set standards for AM stereo. (FCC, Report &Order, Docket 21313, 1982)

While it is impossible to know for sure what motivated the FCC not to set technological standards for AM stereo, the reasons cited included the lack of clear preference between systems, the lack of consistent testing data for all systems, and the arbitrary weighting formula given to the various engineering criteria. These concerns, when coupled with the possibility of selecting a 'wrong" technology and the Reagan Administration's fervor for

deregulation, kept the FCC from selecting or endorsing one system. The Commission acknowledged that AM stereo might fail, and suggested that it would be impossible to tell whether such a possible failure were due to lack of consumer interest in the new technology or lack of a single standard gaining sufficient market share due to the absence of a single standard. Such a market failure, the FCC reasoned, would be no different than similar failures of other new entrants in other industries.

For the most part, AM stereo has failed to materialize. As of early 1987, only ten percent of U.S. AM stations were broadcasting in stereo. Most of the competing AM stereo encoding manufacturers have given up. Very few AM radio receivers have stereo decoding capabilities. Yet petitions submitted to the FCC at the end of 1986 requesting the FCC again deal with establishing a single AM stereo standard were denied in early 1988. The Commission continued to stand by its marketplace decision, refusing to endorse or protect a single AM stereo standard and similarly refused to require that AM receivers be manufactured in such a way as to be able to decode more than one AM stereo system. (FCC, "AM Stereo," 1988) In 1989, AM stereo was still being characterized as "a stagnant issue" by industry observers. (AM Stereo: Up, 1989)

Teletext

Teletext, which generally encodes and transmits its signal in the vertical blanking interval o a television signal, is subject to the same standardization issues facing the other forms of telecommunication discussed here. In order to receive teletext, viewers must have a teletex receiver either built into their television sets or appended to them. Those receivers must be compatible with the teletext signal in order for the consumer to be able to get teletext. Th receivers are expensive, and in several U.S. tests, consumers have been reluctant to purchase them. This reluctance is made more powerful when there are different and incompatible teletext systems in the market. The value of a receiver/decoder is directly related to the amount of information it can access and its perceived inobsolescence. Without a standard transmission/reception format, the value of decoders is somewhat diminished.

In response to a 1981 Notice of Proposed Rulemaking, the FCC was alternately asked to establish a teletext standard by some advocates and asked to turn to a marketplace solution by others. Those requesting the FCC to set a standard included supporters of the North American Basic Teletext Standard (NABTS), which offered superior color and graphics but at a high decoder price. Those in the "free marketplace" camp included supporters of the World Systems Teletext system, which offered lower resolution, a lower price tag, and perhaps

most importantly, was already firmly in place in Great Britain. (Besen and Johnson, 1986, pp. 72-74) The FCC, in 1983, declined to set any teletext standard and simply authorized television stations to offer teletext services by whatever means they saw fit so long as those means did not degradate other spectrum services.

Teletext's growth in the United States has been exceptionally slow. The FCC's decision not to set a standard is likely to have contributed to the slow pace of this growth. It may also be a case of a technology whose use is simply not needed or wanted by the American mass audience. The services offered by teletext may be already available to people through print media, cable television, and personal computers tied in to databases. Besen and Johnson note that while the market for teletext in the U. S. is small, the two different teletext systems are developing side by side. Each is finding its niche, doing what each does best. (Besen and Johnson, 1986, pp.78-80)

Direct Broadcast Satellites

In 1981, the FCC opened proceedings to establish rules for Direct Broadcast Satellites (DBS). The following year, the Commission issued eight construction permits to firms wanting to get into DBS. The FCC

> "imposed no ownership rules or technical standards beyond those required by international agreements, and told potential operators that they could determine for themselves what sort of service (broadcast or common carrier) to offer. (Barke, 1985, p. 147)

Users were also permitted to decide on their own what sort of technical standards to use in operating DBS. In 1983, the FCC created the Advisory Committee on Technical Standards (ACTS) to develop industry recommendations for DBS standards. That group came up with very few areas of standards it could agree on, and did not agree on a single standard for either the transmission or reception of DBS. In 1985 the FCC essentially adopted formally th marketplace solution, so long as DBS users wouldn't be interfering with each others signals. Barke attributes the FCC's refusal to set DBS standards to the deregulatory climate and the lack of a clear industry consensus favoring one one standard, and the perception that DBS technology would improve before there was substantial public demand for DBS so that it made more sense to wait and let the technology further develop rather than prematurely set a standard. "[N]o interest has blamed the FCC's failure to impose standards for the collapse of the DBS industry." (Barke, 1985, p. 148) DBS operators have faced not only a lack of standards, but increased competition as most homes in the U.S. are now wired for cable television, and a dearth of satellite facilities, as failures in intended DBS satellites and in

the U.S. space program have all served to stand in the way of DBS growth.

Lessons From F.C.C Behavior in Telecommunication Standardization

In each of these case studies, the FCC considered issuing or protecting a standard. In the cases of monochrome and color television, the Commission set a standard. It protected one in the case of stereophonic television. But in the cases of AM stereo, teletext, and DBS, the FCC relied squarely on the marketplace and chose not to set any standard. Why the differences? To some extent, the differences may be attributable to the change in composition and philosophy of the Federal Communications Commission. Krasnow, et al (1983) remark in a footnote that

> Mark Fowler's [one of Reagan's FCC Chairs] "commitment to the marketplace has become so much a part of the Washington folklore that former Commissioner Robert E. Lee, raconteur extraordinaire, has worked a reference to it into his repertoire: "'The first time I laid eyes on him,' Lee says, 'I wondered who the young man with the mellifluous voice was, so I asked him his name. He said, 'Let the marketplace decide.'" (p.773) [*Mark S. Fowler: The Name Spells marketplace,* Broadcasting, April 5, 1983, p. 175].

Yet as salient as a change in administration and personnel may be in the determination of policy (Lichty, 1962, and Williams, 1976), it does not completely and satisfactorily explain the policy change. For one thing, It was essentially the same Commission that protected the television stereo standard while rejecting any significant role in creating or protecting a standard for AM stereo, teletext, or DBS. Sterling suggests other explanations for the FCC's more recent hands-off approach to standards setting. He notes that the rapid development of communication technologies (and the accompanying consumer, industry, and advertiser pressure for their development) has made reasoned and careful policy development much more difficult. The FCC, Sterling posits, cannot keep ahead of the technological developments, many of which are either based or have offshoots in the non-regulated communication markets. (Sterling, p. 139). In addition, Sterling blames the federal government's budgetary constraints. "This combination of rapid technological change and economic crisis provide[d] the context for politically oriented questions asking what government can and should do with fewer resources in the midst of wider consumer choice." (p. 140). These conditions, coupled with an unclear charge to the FCC vis-a-vis its proper and intended role regarding new communication technologies, contribute to the Commission's move away from active standards setting. Sterling offers several criteria for judging whether or not to impose government established standards:

•"What are the risks of making the 'wrong' choice?" How well developed and understood is the technology in question?

•How might various standards setting approaches affect the efficient marketing of the service?

•Will government standards protect consumers' choices and investments?

•What is the economic power relationship between the developer, other firms, and the public?

•What non-economic (First Amendment, public safety, etc.) issues are involved, and how will they fare under various standards setting approaches?

•"Will adoption of standards promote efficient use of the spectrum?"

•"Will adoption of standards facilitate some kind of FCC master plan," assuming the FCC has one. (Sterling, pp. 141-145)

To this list of criteria, I suggest another element on the side of FCC standard setting that emerges from the above examples: the affected industry's fairly unified stance supporting a particular standard. In the three cases where standards were established or protected, the industry group that studied the problem forwarded a single standard recommendation. In the cases where the FCC relied on the marketplace, there was no such industry coalescence around a single standard. It is impossible to know in some abstract way whether it was the consensus or the merits of the technology itself that enabled or pushed the standard setting. What does seem to be indicated, however, is that an industry consensus may be a prerequisite for FCC standards setting.

The current unfinished activity in Advanced Television standards setting provides an opportunity to compare these theoretical standards setting concerns to the actual behaviors that are emerging in Washington and elsewhere.

THE NEW AGENDA: ADVANCED TELEVISION

In 1987, the FCC opened a formal inquiry into Advanced Television Systems (FCC, 1987) in which it sought to discover

> the advantages and disadvantages of the various terrestrial broadcast ATV ["advanced television"] implementation options. . . . [T]he Commission will then be in a position to decide whether adoption of some form of advanced broadcast television would be in the public interest, and, if so, what form the system should take. (FCC, 1987, p.

5126)

As part of the discovery process, the Commission empowered an "industry advisory committee" to help it evaluate the options (and perhaps provide it with an industry-supported consensus or standard).[3] The Commission proposed looking at a wide range of ATV systems designed to improve the quality of existent NTSC television. It sought help in the development of evaluation criteria and answers to questions of what different ATV systems were available or being developed, how they worked, how much spectrum they required, what parts of the spectrum might be best suited for ATV use, how compatible each ATV system would be with NTSC, how quickly ATV developments were progressing, how best to implement an ATV system(s), what sort of transition to ATV would be best, and what the public interest or public service implications of implementing an ATV system would be.

Participants in the FCC Inquiry and its industry advisory committees included a wide range of broadcast and cable networks, program providers, stations/systems, manufacturers, a public interest group, and interests supporting non-ATV uses of the UHF television spectrum. Because of the number of contentious interests in this matter, the potentially huge amounts of money involved (there may well be over $100 Billion dollars in the present television plant in the U.S.), the difficulty associated with changing a decision after it is put into place, and the changing technological frontier, "final" resolution is likely to be years off, despite the FCC's stated desire to expedite this proceeding.

Further complicating the process is the Congressional involvement. House Telecommunications Subcommittee Chair Ed Markey presided over special demonstrations of advanced television systems in September, 1988, and remarked that it would be Congress, rather than the FCC, that would have to "construct a policy" regarding ATV. According to a Broadcasting magazine report, "The FCC will have a significant role [Markey said], but it does not have the jurisdiction to address the jobs and trade issues. ("HDTV proponents," 1988, p.30) It is not simply that another standards-setting organization (Congress) adds voices to the discussion and introduces possible jurisdictional disputes, but it may broaden the applicable issues. At an address before the Association of Maximum Service Telecasters, "Markey warned that progress toward reaching HDTV transmission solutions will depend greatly upon broadcaster repudiation of the 'marketplace' philosophy that has been dominant in the 1980's and a return to a belief in the 'public interest' ideal." (U.S. Industry, 1988, p.31) Adding another issue, and a volitile one at that, to the list of things that must be resolved before an ATV standard is set may slow the system further, or may simply shift some of the power relationships. It seems unlikely that Congress will soon get strong and widespread broadcaster support of the "public trustee" standard in place of the "marketplace" standard

of regulation, particularly if such a policy preference turnaround might result in an ATV system that might come to harm the interests of entrenched broadcasters. Markey is clearly pushing for such a turnaround, as is evidenced by his remark/threat to the broadcasters:

> ...you will be much better served by the public interest standard . . . Pure market forces, left unattended, likely would propel HDTV right past broadcasters to the consuming public through the media of cable or DBS. (U.S. Industry, 1988, p.31)

The various systems of ATV that are being developed and considered differ from one another and even from earlier incarnations of themselves. Aside from who is putting them forth and just how each actually operates to make its improvements to the television picutre and sound, the main salient differences among the systems revolve around the amount of spectrum they would need, their level of compatibility with existing NTSC television, and, perhaps, their ability to adapt to improvements in the technology yet to come. To the extent that systems are not compatible with each other or with NTSC, standard-setting (whether established cooperatively by the industry or by the government) is important to ATV's growth and survival. It should be recalled that standards are not particularly important for products that have short life expectancies, are very inexpensive, and do not interact with anything else. Clearly these descriptors do not apply to ATV, where receivers will have to interact with transmitters and/or other program sources, have relatively long lives, and will cost more than conventional television receivers (early estimates place anticipated costs for an ATV receiver in the one- to four thousand dollar range, though the actual cost will reflect the amount of mass production and economies of scale that will be present in ATV receiver manufacture, the technical system requirements, and other market considerations). Absent a standard for ATV (whether that standard be set by government or be a defacto one), ATV is not likely to have much more success penetrating the home marketplace than AM stereo radio did. Certainly AM radio and ATV cannot safely be presumed perfectly analogous. The cost of purchasing an AM stereo radio were and remain much lower than the projected cost of purchasing an ATV receiver. The AM stereo receivers that were available permitted reception of all AM stations, even though they may have been decoded in stereo if they used an incompatible stereo system. That may or may not be the case with ATV systems. Perceived value to the consumer of having the "extra" qualities AM stereo and ATV receivers offer may too be quite different. Yet, given the lack of market penetration success inexpensive AM stereo had, it seems fair to speculate that ATV, which will undoubtedly be far more expensive for consumers to buy into, is not likely to meet with wide success absent some assurance that at the very least, the receivers being sold will do what they are purported to do: receive and display high resolution advanced television signals. Of course, implementation

of an ATV standard does not guarantee its market success. It must be recognized that an "incorrect" standard, or a product whose cost exceeds its consumer-perceived value, is not likely to succeed.

MIT's William Schrieber has noted that this is not simply a story about putting better television pictures in American homes. It is a story about money. (Schreiber, 1988, p.3) And while this "money" story centers on American media, it is more far reaching than that. Those concerned with the "American" economy also are concerned. A 1988 Report to the National Telecommunications and Information Administration notes the enormity of the potential ATV employment market that the United States may gain (or lose), depending on where the ATV equipment is produced. (Darby, 1988, pp.41-44) Relying on an A. D. Little, Inc. analysis of consumer electronics related employment, Darby figures that every $1 Billion

> worth of value added created by US consumer electronics suppliers is associated with about 35,000 US jobs. These jobs are scattered throughout the economy—manufacturing, service, utilities, trade and transportation, for example. They represent the direct employment created in the electronic products production chain. (Darby, 1988, p.42)

By way of speculative projection, Darby points out that if ATV receivers cost $600 each, and if 11.5 million units were sold in the U.S. in the year 2003, that would mean 240,000 jobs. Those would be U.S. jobs to the extent that ATV sets were manufactured in the U.S.. "Bear in mind that total employment in 1986 for all US consumer electronic industries was about 63,000." (Darby, 1988, p. 43) Add to that the very serious impact (positive or negative) that American and international sales of ATV receivers could have on the U.S. balance of payments deficit, and the interests of the State and Commerce Departments, Congress, and others becomes evident. To them, it may be that the best TV picture is one made in the United States by U.S. firms. Clarity has many measures.

The successful penetration of ATV into American homes is not necessarily in the best interests of all the players. If ATV changes the American television system, then it threatens the already shifting power relationships of that system. Just as the then powerfu broadcasters attempted to stall the development of cable television (which promised both clearer pictures and more options) in the 1960's, 70's, and 80's, if new ATV systems change the relative position of the players in such a way as to diminish the already slipping dominance of broadcasters, they can be counted on to oppose them. Likewise, ATV systems that would be inappropriate for cable television will be opposed by that industry. This explains the active interest both cable and broadcast television firms have had in ATV. Broadcasters and cable operators are supporting testing of what is sometimes called

advanced compatible television, or NTSC-frieandly television. In May, 1989, for example, Multichannel News announced on its fron page that cable operator Tele-Communications Inc "is heading up an effort to form a consortium of cable concerns . . . to support Faroudja Laboratories' SuperNTSC advanced television system." (Swasey, 1989, p. 1). Similarly, Cable Laboratories Inc. was set up by cable MSOs in 1988 to study and promote technological advances for cable. Richard Green, Cable Lab's president and CEO, placed ATV research among the most important areas for the lab. Cable Lab may not be engaging in what might be called agenda-free pure research. Green wants "to cooperate with the broadcasters closely on thee tests and in all matters related to high-definition television." (Busy week, 1989) American video producers/distributers should also be counted on to lobby for or against various ATV proposals depending on how those proposals are likely to impact the producers' and distributers' interests. The implentation of an ATV system that does not use the resources o particular ATV developers will not be in those firm's best interests, and can be counted on to endure the wrath of such firms. (Arrangements permitting firms to share in the "winnings" that a new and successful system might bring, could servce as an incentive for those firms t abandon their own proprietary systems in favor of something else.) And consumers, it should be expected, will want low risk and lowest-possible costs to get their ATV. And depending on how an ATV system is ultimately configured, there is the possibility that consumers may find themselves missing some sorts of programming that once appeared on conventional "free" TV or "conventional" and perhaps less pricey cable television.

The players and their interests are more far reaching than those parochial ones of firms, American industries, and consumers as customers. Also involved are foreign firms and countries, who may want U.S. business but not U.S. domination. In this ever-shrinking and increasingly interdependant world, non-U.S. interests are likley to be impacted by (and attempt to impact) any US ATV system that develops.

The television content and power issue is relevant insofar as ATV changes American's video habits. If a system is embedded that broadcasters cannot take advantage of, and if such a system is a success with consumers, broadcasters will lose more of their share of the audience than they have already lost to cable television and prerecorded video. The development of FM radio over AM instructs us that the older broadcast outlets did not fade away, but they changed their content in search for a new niche. Something similar could happen to broadcast stations. The FCC and Congress have long been concerned about the viability of the "local" broadcast system. FCC has already flavored the ATV standards debat by reporting that it favors an NTSC-compatible 6-MHz system. (FCC Writes, 1988, p. 32) Such a system would offer a measure of protection to the over the air system of broadcastin

the FCC is charged with maintaining and which Congresspeople rely on to reach the voters back home. Such "tampering" with the shape of ATV is not directed by concerns over the prettiest picture reproduction possible.

Prospects for a U.S. Advanced Television Standard

Based on the general technological standards-setting literature, in order for ATV to succeed and become widespread in the United States, some sort of standard will have to be adopted. Timing is critical. The world-wide leader in high definition television, Japan's NHK, has been planning (or, at least, threatening) to introduce a system to the United States via Direct Broadcast Satellite and prerecorded video in around 1990, perhaps in an attempt to preempt other systems which may be available after that date. At the 1988 National Association of Broadcasters convention, the urgency with which American interests must address the ATV situation was summed up by the expressed fear that NHK's High Definition TV equipment is "on the boat" to the U.S. now. ("All Eyes", 1988, p. 47) "Nothing like . . . NAB's showcase of the latest in ATV developments [ ] has been seen before — at least not in this country." ("All Eyes," 1988, p. 48) Such pronouncements may have been a tad hasty and overblown. NHK's early HDTV system has not made inroads in the American consumer or distribution market.

Until recently, much of the focus of ATV developers was on derailing the perceived leader in the field, NHK. Whatever their differences, the dozen or so ATV system contenders seemed to be spending a great deal of time and energy to stop NHK from overtaking them and gaining a defacto standard. (McKnight and Neil, 1987). Broadcasting noted that "[i]f the Japanese are not slowed, the standards battle will be over before it gets started." ("All Eyes," 1988, p.49) It is possible that an ATV *production* standard may be in place already. In October, 1988, the American National Standards Institute (ANSI) board of review approved the Japanese-approved 1,125-line standard. "ANSI's Dorothy Hogan said that group's endorsement established . . . [a] 'national consensus standard." (HDTV endorsement, 1988, p.9) The amount of available 1,125/60 equipment is growing. Yet, in March, 1989, Broadcasting reported that "[e]vents seem to suggest that the chances for worldwide adoption of the 1,125/60 high-definition production system . . . are growing dim." (On the Road, 1989, p. 43) While the production standard is an important issue, the existence of a production standard, however, need not dictate the transmission standard. Note that 16mm and 35mm films, and various formats of videotape, are transmittied over NTSC television without problem. But in order for a transmission standard to be set, there is going to have to be a high degree of industry support for that standard, as is the case with any government-imposed non-safety standards. And given the growing number of firms in whose interest it is not to have the U.S. adopt an

NHK standard, it is unlikely that the NHK systems, as they are presently configured, will be adopted as the U.S. standard anytime soon.

Conditions or reasons for standards setting in the case of ATV seem abundant. All of the sysetmes being proposed involve huge producer and consumer expenditures in order to succeed. Existing media services, spectrum use and conservation, and media externalities ar all potentially seriously affected. These provide a major impetus for ATV standardization. Yet, so long as the major parties remain at loggerheads regarding even the evaluation criteria, a standard is far off. The Advisory Committee on Advanced Television Service (ATSC) that the FCC called for in its Notice of Inquiry (1987) is busily attempting to arrive at evaluation criteria and later will evaluate various ATV systems and standards options. The Committee has its work cut out for itself. Not only would such evaluation be a difficult policy question for the disinterested, but it is bound to be complicated by the fact that many of the ATSC members represent opposing ATV systems and interests. The debate over which system(s) is/are "best," and what qualities are worth what other trade offs, is likely to take at least a couple of years. Contending systems will have to be tested in both the lab and the field, and most of the systems have not yet been able to put the hardware together that will enable demonstration and testing. Members of the FCC's ATSC have suggested that mid to late 1991 is the earliest the committee might be able to recommend an ATV standard to the FCC. (HDTV standardization, 1989) During the interim, system developers with something concrete to show will try and speed up the decision making process, those still in the lab will try to keep it from moving so quickly as to exclude them. Pressure from non-ATV users to get more of the electromagnetic spectrum may increase. It was such pressure that led the FCC to look into ATV standards in the first place. The time between now and 1991 will see changing technologies, changing alliances, and changing perceptions of self interests.

Standards are set when either one firm so dominates a market that its specifications become the industry standard, there is a high degree of inter-firm cooperation based on perceived mutual benefit, or the government sees an immediate need for a standard. None of those conditions appear ripe at the present <u>vis-a-vis</u> ATV. This may not be true for very long, however. American ATV developers, for all of their competitiveness, may be about to engage in wagon-circling behavior. They have asked the U.S. government to provide significant seed money in order to more competitively counter foreign developers. Secretary of Commerce Robert Mosbacher has suggested a different approach: exemption from anti-trust laws that would allow for co-development and production of equipment. This suggested special treatment is being justified (and supported by <u>The New York Times</u>) in the context of being necessary for the survival of the American <u>electronics</u> industry. (Should Uncle Sam, 1989)

This is important as both a commerce issue and as a defense-related issue. Indeed, the Defense Department's Defense Advanced Research Projects Agency (DARPA) announced that it intends "to provide $30 million in funding for two to four HDTV proposals," and Congress is about to consider bills that would fund HDTV research to the tune of up to hundreds of millions of dollars. (HDTV week, 1989, p. 68) If ATV is being re-framed as a national-economy and a national-security issue, in addition to all of the other media-related issues it so naturally touches on, and if erstwhile competitors are permitted or encouraged to share the same interests, then industry consensus is more likely to emerge in support of a single standard. If and when that happens, the standard will be set either by government endorsement or simply by defacto methods. Although these ane substantial "ifs," the outlook for adoption of an ATV standard looks positive. Such a standard, should it develop, can not, by necessity, reflect everyone's judgment of "best". There clearly will be winners and losers in this battle. Studying the battle strategies would make a marvelous research project. Assuming ATV standards evolve or are set, advanced television will not be a pretty picture for everyone.

As the development of ATV in the United States takes place, it will be interesting to watch which system(s) and interests come to dominate the debate and the marketplace, and how the standards-setting marketplace will operate in this context. Advanced television will not be a pretty picture for everyone.

FOOTNOTES

1. "Advanced Television" (ATV) refers here to any form of television service offering much improved fidelity. "High Definition TV" (HDTV), while sometimes used as a synonym for ATV, more accurately refers to a particular version of ATV.

2. Of course, this is not always and necessarily the case. Krasnow, et al (1983, p. 767) relate a messy situation brought on by the FCC which opened up an application opportunity for "interim" low power television licenses. They write:"[T]he FCC invited people to apply for facilities for which there were no technical standards, much less any appropriate application form. These factors did not discourage the thousands of applicants eager to participate in this 'gold rush' for television spectrum space." (p. 767) Eager as the applicants were to get a piece of the action, their applications (and the development of low power TV) has proceeded at a snail's pace, perhaps slowed by the dearth of standards or criteria.

3. Reliance by federal regulators on the industries they regulate for scientific and technical data and evaluation is not uncommon. See: Brooks (1986).

REFERENCES

All eyes on HDTV at the NAB convention. (1988, April 18,). Broadcasting, p. 47.

AM stereo: Up and walking. (1989, April 3). Broadcasting, pp. 73-74.

Ashford, N., Ayers, C., & Stone, R. (1985). Using Regulation to Change the Market for Innovation. Harvard Environmental Law Review, 9, 419.

Barke, R. (1985). Regulation and Cooperation Among Firms in Technical Standard-Setting. Journal of Behavioral Economics, 14 (Winter) 141.

Bernstein, M. H. (1955). Regulating Business by Independent Commission. Princeton: Princeton Univ. Press.

Besen, S. M., & Johnson, L. L. (1986). Compatibility Standards, Competition, and Innovation in the Broadcasting Industry. Santa Monica: Rand Corp.

Besen, S. M., & Saloner, G. (1988) Compatibility Standards and the Market for Telecommunications Services. mimeo.

Boren, J. (1975). Have Your Way With Bureaucrats: The Layman's Guide to Pyramiding Featherheads and Other Strange Birds. Radnor, PA: Chilton Bks.

Braunstein, Y., & White, L. (1985). Setting technical compatibility standards: an economic analysis. The Antitrust Bulletin. (Summer) 337-355.

Brooks, H. (1986). National Science Policy and Technological Innovation. In R. Landau and N. Rosenberg (eds.), The Positive Sum Strategy: Harnessing Technology for Economic Growth (pp. 119-167) . Washington, D.C.: National Academy Press.

Busy week for Cable labs. (1989, March 20). Broadcasting, p. 75.

Darby, L. F. (1988). Economic Potential of Advanced Television Products. Report to National Telecommunications And Information Administration. Darby Associates.

Davis, G., & Helfand, G. D. (1985). The Uncertain Balance: Governmental Regulators in the Political Process. Wayne, NJ: Avery Publishing Group.

Farrell, J. & Saloner, G. (1984) Standardization, Compatibility and Innovation. Cambridge, MA: M.I.T. Working Paper #345, April, 1984.

Farrell, F. & Saloner, G. (1986) Economic Issues in Standardization. In J. Miller (ed.), Telecommunications and Equity. (pp. 165-177) Amsterdam: Elsevier Science Publishers B.V.

Federal Communications Commission. (1982). Report and Order, Docket 21313, AM Stereophonic Broadcasting. 51 Rad. Reg. 2d. 1, 47 FR 13152.

Federal Communications Commission. (1987). Notice of Inquiry, Advanced Television Systems, Docket 87-268. 2 FCC Rec 5125.

Federal Communications Commission. (1988). Memorandum Opinion and Order, FCC 88-16, AM Stereophonic Broadcasting. 64 Rad. Reg. 2d. 516.

FCC unlikely to change duopoly rule; Felker and Holmes answer questions on petition to deny problem, ATV standards and syndicated exclusivity. (1988, April 18,). Broadcasting, p. 56.

FCC writes a first draft for HDTV. (1988, Sept. 5). Broadcasting, pp. 32-34.

Fink, D. G. (1976). Perspectives on Television: The Role Played by the Two NTSC's in Preparing Teleivison Service for the American Public. Proceedings of the IEEE. pp. 1322-1331.

Grabowski, H. G., & Vernon, J. M. (1979). The impact of regulation on industrial innovation. Washington, DC: National Academy of Sciences.

Green, H. P. (1983). Should Technology Assessment Guide Public Policy. American Bar Association Journal, 69, 930+.

HDTV endorsement. (1988, Oct. 10). Broadcasting. p. 9.

HDTV proponents show their stuff. (1988, Sept. 12,). Broadcasting. p. 30.

HDTV standardization hits roadblocks. (1989, Feb. 20). Broadcasting. p.59.

HDTV week on Capitol Hill. (1989, May 15). Broadcasting. pp. 67-68.

Johnson, L. L., Sirbu, M. A. , & Mitchell, B. M. (1985). Telecommunications Alternatives for Federal Users: market trends and decisionmanking criteria. Santa Monica, CA.: Rand Corp, R-3355-NSF.

Kindleberger, C. P. (1983). Standards as Public, Collective and Private Goods. Kyklos , 36, 377-396.

Krasnow, E., Cole, H., & Kennard, W. (1983). FCC Regulation and Other Oxymorons: Seven Axioms to Grind. Comm/Ent Law Journal, 5, (4) 759+.

Lichty, L. (1962). The Impact of FRC and FCC Commissioners' Backgrounds on the Regulation of Broadcasting. Journal of Broadcasting, 6, (Spring) 97-110.

Meyer, J. B. (1984). The FCC and AM Stereo: A Deregulatory Breach of Duty. University of Pennsylvania Law Review, 133, 265-286.

McKnight, L. & Neil, S. (1987). The HDTV War: The Politics of HDTV Standardization. mimeo. Cambridge, MA: Research Program on Communications Policy, M.I.T. Reprinted in Akgun, M. (Ed.), From Studio to Viewer. Proceedings of the Third International Colloquium on HDTV, (pp. 5.6.1 - 5.6.17) . Ottawa, Canada: Canadian Broadcasting Corporation.

On the Road to NAB: HDTV. (1989, March 27). Broadcasting. pp. 43-44.

Owen, B. M., & Braeutigam, R. (1978). The Regulation Game: Strategic Uses of the Administrative Process. Cambridge, MA: Ballinger.

Schreiber, W. F. (1988). Advanced Television Systems for the United States: Getting There from Here. mimeo, April 4, 1988. Cambridge, MA.: M.I.T. Media Lab.

Schmandt, J. (1984). Regulation and Science. Science, Technology, & Human Values, 9, (1, Winter) 23-28.

Schwartz, G. G. (1988). Why Changes in Telecommunications Regulation Should Be Made

Slowly and Carefully. Public Utilities Fortnightly, 121, (4, Feb.) 31-35.

Should Uncle Sam Tilt to HDTV? (1989, May 15). New York Times. (editorial) p. A18.

Sterling, C. H. (1982). The FCC and Changing Technological Standards. Journal of Communication. 32 (4) 137-147.

Swasey, L. (1989, May 8) TCI Leads Effort to Form SuperNTSC Consortium. Multichannel News, p. 1.

U.S. industry reacting late to HDTV, Markey charges. (1988, Sept. 12). Broadcasting. p. 31.

Williams, W. Jr., (1976). Impact of Commissioner Background on FCC Decisions: 1962-1975. Journal of Broadcasting, 20. (Spring) 244-256.